

Observations of aerosol-radiation-cloud interactions in the South-East Atlantic: first results from the ORACLES deployments in 2016 and 2017

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Southern Africa produces almost a third of the Earth’s biomass burning (BB) aerosol particles. Particles lofted into the mid-troposphere are transported westward over the South-East (SE) Atlantic, home to one of the three permanent subtropical stratocumulus (Sc) cloud decks in the world. The SE Atlantic stratocumulus deck interacts with the dense layers of BB aerosols that initially overlay the cloud deck, but later subside and often mix into the clouds. These interactions include adjustments to aerosol-induced solar heating and microphysical effects, and their global representation in climate models remains one of the largest uncertainties in estimates of future climate. Hence, new observations over the SE Atlantic have significant implications for regional and global climate change predictions.

The low-level clouds in the SE Atlantic have limited vertical extent and therefore present favorable conditions for their exploration with remote sensing. On the other hand, the normal coexistence of BB aerosols and Sc clouds in the same scene also presents significant challenges to conventional remote sensing techniques.

We describe first results from NASA’s airborne ORACLES (ObseRvations of Aerosols Above Clouds and Their IntEractionS) deployments in September 2016 and August 2017. We emphasize the unique role of polarimetric observations by two instruments, the Research Scanning Polarimeter (RSP) and the Airborne Multi-angle SpectroPolarimeter Imager (AirMSPI), and describe how these instruments help address specific ORACLES science objectives. Initial assessments of polarimetric observation accuracy for key cloud and aerosol properties will be presented, in as far as the preliminary nature of measurements permits.

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